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POTASSIUM CONCENTRATION AND UPTAKE BY TIFTON 85 BERMUDAGRASS IN FIVE CUTTINGS IN 2004

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Background. The relatively recent release of Tifton 85 and the lack of research to determine how it responds to applied plant nutrients prompted the initiation of this study designed to evaluate Tifton 85 response to potassium (K) rates and sources on Darco loamy fine sand. Potassium rates, in addition to a zero check plot were 134, 268, and 402 lb K_2O/ac, applied in three split applications during the early to mid-season. Each K rate was applied as muriate of potash (0-0-60, potassium chloride, KCl), sulfate of potash [(0-0-50 + 17.6% sulfur (S)], potassium sulfate, K_2SO_4), or muriate of potash plus elemental sulfur at K and Cl rates equal to the KCl-only treatments and at sulfur (S) rates equal to those applied as potassium sulfate. The intent of these split-plot treatments was to determine if Cl or S applied with the K would give an additional yield increase above the response to K. Split-plot K treatments were applied to main plot nitrogen (N) rates of 80 and 160 lb of N/ac for the first growth of bermudagrass in spring and for each regrowth during the season. Each treatment was applied to 10 x 18 ft plots with four replications. Nitrogen was applied by dropping it at a constant flow rate from a 5-ft-wide Gandy spreader. Harvests were made using a self-propelled forage plot harvester with a 5-ft-wide cutter bar (Swift Machine Co., Swift Current, Saskatchewan Canada.) Harvest length was measured and the area calculated. At harvest, the cut forage was weighed and a grab sample of the forage was taken for dry matter content and chemical analysis. This sample also was weighed on the harvester, oven dried at 60 °C for 48 hours, ground < 20 mesh, digested in acid, and the resulting solution was analyzed for nutrient content.

Research Findings. Plant K concentration was unaffected by increasing the N rate from 80 to 160 lb/ac per bermudagrass regrowth (Table 1). However, the increased yield in harvests 4, 5, and in total caused a significantly increased K uptake by bermudagrass (Table 2). Total K uptake was increased by 43 lb/ac at the higher N rate. Concentration of K was significantly increased with each increase in applied K (Table 1) even as yield continued to increase. When averaged over N rate and K source, increasing the rate of applied K from zero to 402 lb/ac increased K uptake by 251 lb/ac (Table 2). However, as the rate of applied K was increased from zero to 134, 268, and 402 lb K_2O/ac, K uptake efficiency declined from 78.35%, to 72.76%, and 62.44%, respectively. Differences in K concentration due to source of applied K were inconsistent or not statistically significant (Table 1), but increases in yield caused by K sources caused statistically significant increases in total K uptake to occur (Table 2).

Application. The normal dilution effect with increased yield observed with some plant nutrients apparently does not occur with K when sufficient or excess K is available. These data indicate that Tifton 85 uptake of K ranges from 24 to 53 lb/ton (29 to 64 lb K_2O/ton) of dry matter as yield response to increasing K increased from 4.8 to 6 tons/ac.

Table 1. Tifton 85 bermudagrass K conc. response to N and K rates and K and S sources in 2004.

N rate	Plant K concentration†					
lb/ac/harvest	Harvest 1	Harvest 2	Harvest 3	Harvest 4	Harvest 5	Season avg.
	----------	----------	----------	%----------	----------	----------
80	2.34	2.49	2.09	2.24	1.96	2.22
160	2.26	2.32	2.00	2.21	1.98	2.15
K_2O, lb/ac						
0	1.72 d	1.32 d	1.04 d	1.16 d	1.05 d	1.26 d
134	2.00 c	2.10 c	1.59 c	1.86 c	1.53 c	1.81 c
268	2.44 b	2.64 b	2.24 b	2.42 b	2.18 b	2.38 b
402	2.65 a	2.84 a	2.63 a	2.75 a	2.50 a	2.67 a
K Source						
KCl	2.37	2.49 b	2.11	2.31	2.18 a	2.30
K_2SO_4	2.33	2.49 b	2.15	2.32	1.97 b	2.20
KCl + S	2.39	2.60 a	2.20	2.40	2.05 b	2.33
R^2	0.85	0.94	0.94	0.94	0.92	0.96
c.v.	8.0	6.5	8.2	6.9	9.3	5.5

†Values in a column/group followed by a dissimilar letter are significantly different statistically ($\alpha = 0.05$).

Table 2. Tifton 85 bermudagrass K uptake response to N and K rates and K and S sources in 2004.

N rate	K uptake by harvest and total†					
lb/ac/harvest	Harvest 1	Harvest 2	Harvest 3	Harvest 4	Harvest 5	Total
	----------	----------	----------	lb/ac----------	----------	----------
80	25	36	56	77 b	63 b	258 b
160	28	38	55	94 a	86 a	301 a
K_2O, lb/ac						
0	16 c	15 d	19 d	31 d	32 d	114 d
134	22 b	31 c	41 c	69 c	55 c	219 c
268	29 a	42 b	63 b	95 b	81 b	309 b
402	31 a	46 a	75 a	111 a	101 a	365 a
K Source						
KCl	27	36 b	49 b	83 c	78 b	273 c
K_2SO_4	27	41 a	64 a	92 b	73 b	297 b
KCl + S	29	42 a	65 a	101 a	86 a	323 a
R^2	0.74	0.87	0.88	0.90	0.89	0.93
c.v.	19.4	13.6	17.0	13.6	15.4	11.0

†Values in a column/group followed by a dissimilar letter are significantly different statistically ($\alpha = 0.05$).